

Population Aging, Inter-Industry Transmission, and Urban-Rural Welfare in China: A SAM-Based Structural Path Analysis

Topic: Input-Output Analysis: Employment policies (1)

Author: Shugang Fan

Co-Authors: Ying Gao, Yufei Jia, Shantong LI, Jianwu HE

China's rapidly advancing population aging is reshaping the age-skill structure of the labor force and, through this process, profoundly affecting industrial development, income circulation, and the distribution of household welfare. Against this backdrop, this paper addresses three main questions: how population aging will affect China's aggregate output; through which industrial sectors, factor income distribution channels, and household income channels this shock is primarily transmitted; and how its welfare effects are distributed between urban and rural households. Answering these questions is of considerable theoretical and practical importance for understanding the internal mechanisms through which aging influences China's structural economic adjustment and for informing the formulation of long-term development strategies. Furthermore, aligning with the contemporary policy paradigm of "investing in people", this study provides crucial insights for formulating long-term development strategies that emphasize human capital accumulation to mitigate demographic pressures.

To address these issues, this paper develops an integrated micro-macro analytical framework that combines microdata from the China Family Panel Studies (CFPS) with Social Accounting Matrix (SAM) multiplier analysis and Structural Path Analysis (SPA). On this basis, SAM multipliers are calculated, and SPA is employed to decompose global multiplier effects into elementary paths so as to identify the dominant transmission chains and key amplification nodes.

The micro-level data are drawn from the 2018, 2020, and 2022 waves of the CFPS, which provide information on demographic characteristics, education, and employment, with industrial codes that can be consistently mapped onto the sectoral classification used in the SAM. The macro-level data consist of SAMs for 2018, 2020, and 2023, compiled by the authors on the basis of input-output tables published by the National Bureau of Statistics of China. These SAMs include 42 commodity accounts, 42 activity accounts, three labor factor accounts disaggregated by skill level (low-, medium-, and high-skilled labor), one capital account, and institutional accounts including urban and rural households. In addition, drawing on CFPS-based micro evidence and population projections, the paper constructs three scenarios: a baseline scenario (BAU) calibrated to observed labor supply trends, an accelerated scenario (S1) reflecting expected demographic pressure, and a skill-upgrading policy scenario (S2) guided by the "investing in people" concept, in which targeted human capital investment partially offsets the demographic shock.

The contributions of this paper are threefold. First, it adopts an updated SAM compilation approach to construct a multi-period SAM for China tailored to the analysis of population aging, thereby providing a more relevant accounting foundation for structural analysis. Second, it embeds micro-level demographic and skill characteristics into a macro-level inter-industry linkage framework, helping to bridge the micro-macro disconnect that is common in studies of aging and structural transformation. Third, by integrating SAM multiplier analysis with SPA, the paper not only measures the aggregate economic effects of population aging, but also reveals which sector-factor-household transmission chains dominate the propagation of the shock and how intermediate input networks across industries amplify the initial disturbance.

The results show that population aging reduces aggregate economic output. This shock is transmitted primarily through low-skilled labor channels in traditional sectors and is further amplified by inter-industry intermediate demand networks. At the same time, the distributional effects of aging are markedly asymmetric, with rural households suffering substantially greater welfare losses than urban households. However, policy scenario simulations indicate that targeted human capital upgrading can effectively offset part of the adverse effects of aging and significantly narrow the

urbanâ€“rural welfare gap. Accordingly, responding to the challenges of population aging requires better coordination between industrial restructuring and human capital investment policies. In particular, greater emphasis should be placed on vocational training and rural education in order to mitigate the economic consequences of population aging and promote high-quality economic development in China.